Geospatial Technology Education (GeoTEd) - Unmanned Aircraft Systems (UAS) in Virginia's Community Colleges

Chris Carter
Deputy Director
Virginia Space Grant Consortium
757-766-5210
cxcarter@odu.edu

NASA
VIRGINIA SPACE GRANT CONSORTIUM

THOMAS NELSON

VGEP Virginia Geospatial Extension Program

GeoTEd geoted.org

Mountain Empire Community College

Virginia's Community Colleges

Virginia Space Grant Consortium (VSGC)

- NASA National Space Grant College and Fellowship Program (1989)
- STEM Education, Workforce Development, Research, and Outreach
- Recruit and train U.S. Citizens, especially women, underrepresented minorities and persons with disabilities, for careers in STEM
- Mary Sandy, Director (msandy@odu.edu)
- ODU is host institution. Office in Peninsula Workforce Development Center, Hampton

VSGC Member Institutions

College of William and Mary

Hampton University

Old Dominion University

University of Virginia

Virginia Tech

NASA Langley Research Center

NASA Goddard Space Flight Center's Wallops Flight Facility

State Council of Higher Education for Virginia

Virginia Community College System

Virginia Department of Education

MathScience Innovation Center

Science Museum of Virginia

Virginia Air and Space Center

Center for Innovative Technology

Geospatial Technology Initiatives

3 NSF-Advanced Technological Education (ATE) Awards

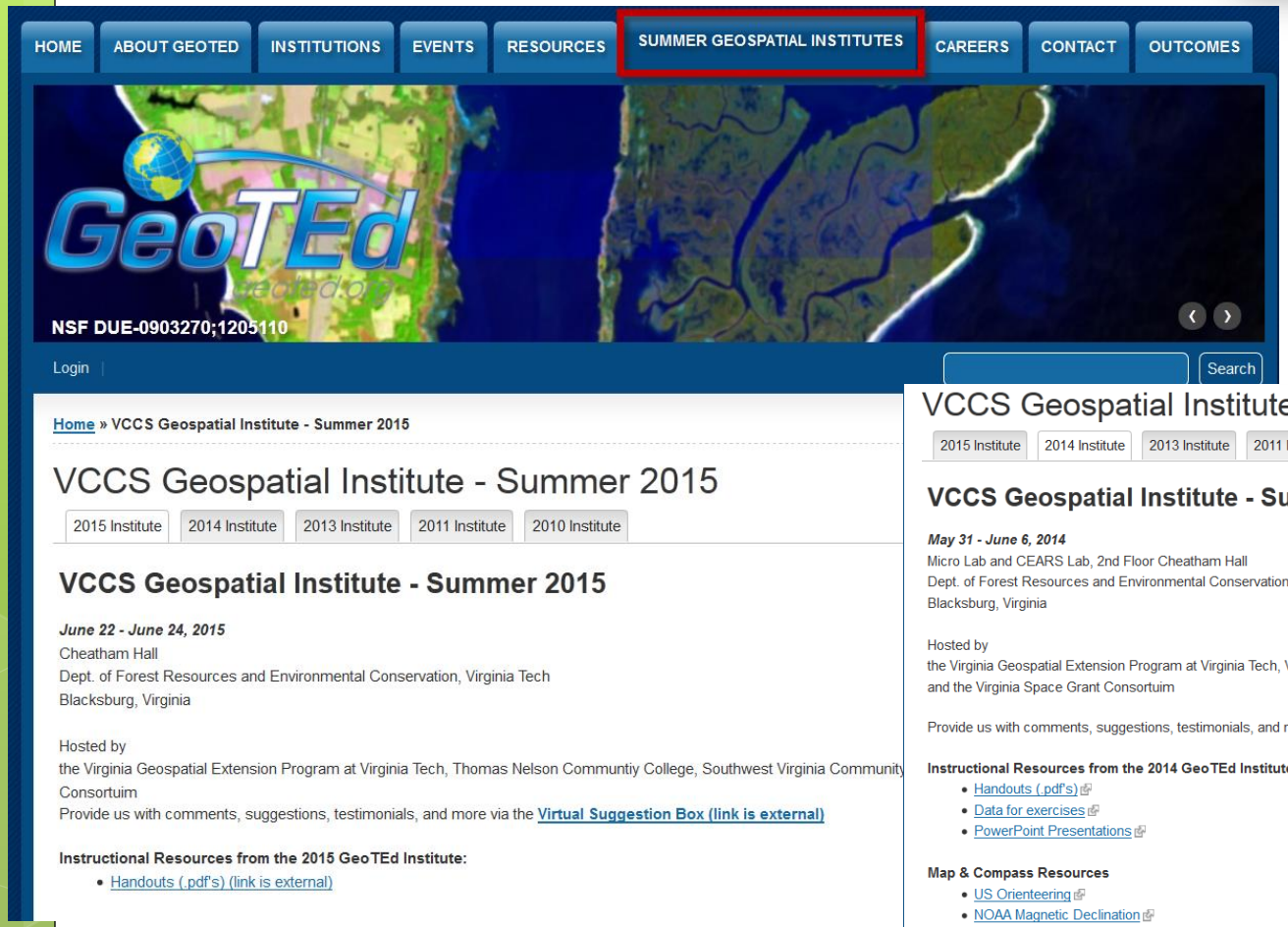
Goal: Increase Number of Trained GIS Technicians

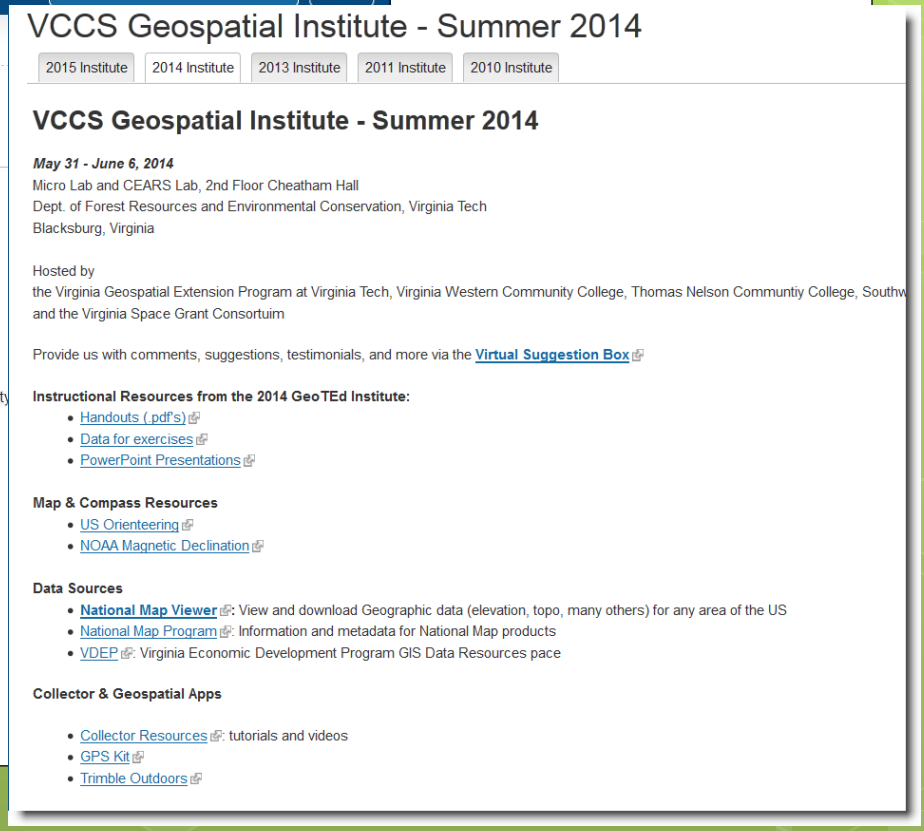
1. NSF Planning Project (2007)
   - Statewide Workforce Needs survey; DACUM to define GIS Technician
2. Statewide Project Grant (2009-12)
3. GeoTEd (2012-16) – Regional Project
   - GIS Courses and Pathways; Faculty and Teacher Professional Development; Mentoring; GIS Webportal; Mobile App
   - Integration of UAS

GeoTEd
geoted.org

NSF ATE DUE-0903270; 1205110

Geospatial Technology Resources





GeoTEd.org

Geospatial Technician Education Unmanned Aircraft Systems (GeoTEd-UAS)

- Three-year NSF ATE project proposal. In final negotiation for award (still pending).

"In Virginia….Looking Down is Looking Up!"

GeoTEd
geoted.org

Other Partners

- Mid-Atlantic Aviation Partnership (MAAP)
- NASA Langley
- NASA Wallops
- Hampton Roads Chapter of AUVSI
- GeoTech National Center
- SpaceTec
- Flirtey
- Timmons
- Sentinel Robotic Solutions
- AirSight Global
- Nexutech
- Esri
- Jack Kennedy
- Northland Technical College
- Environmental Monitoring Incorporated
- University of Virginia

(GeoTEd-UAS)

Focus on ‘UAS Operations Technician’

Mission Planning

Flight Operations

Data Collection

Data Post-Processing

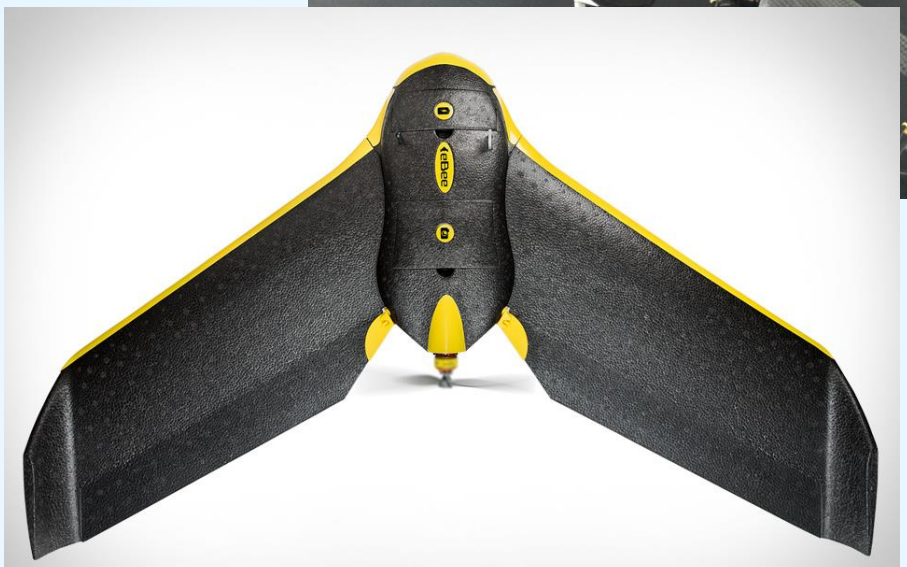
Data Analysis Using GIS

CyberSecurity Awareness

Not Just a Pilot or a Maintenance Technician

(GeoTEd-UAS)

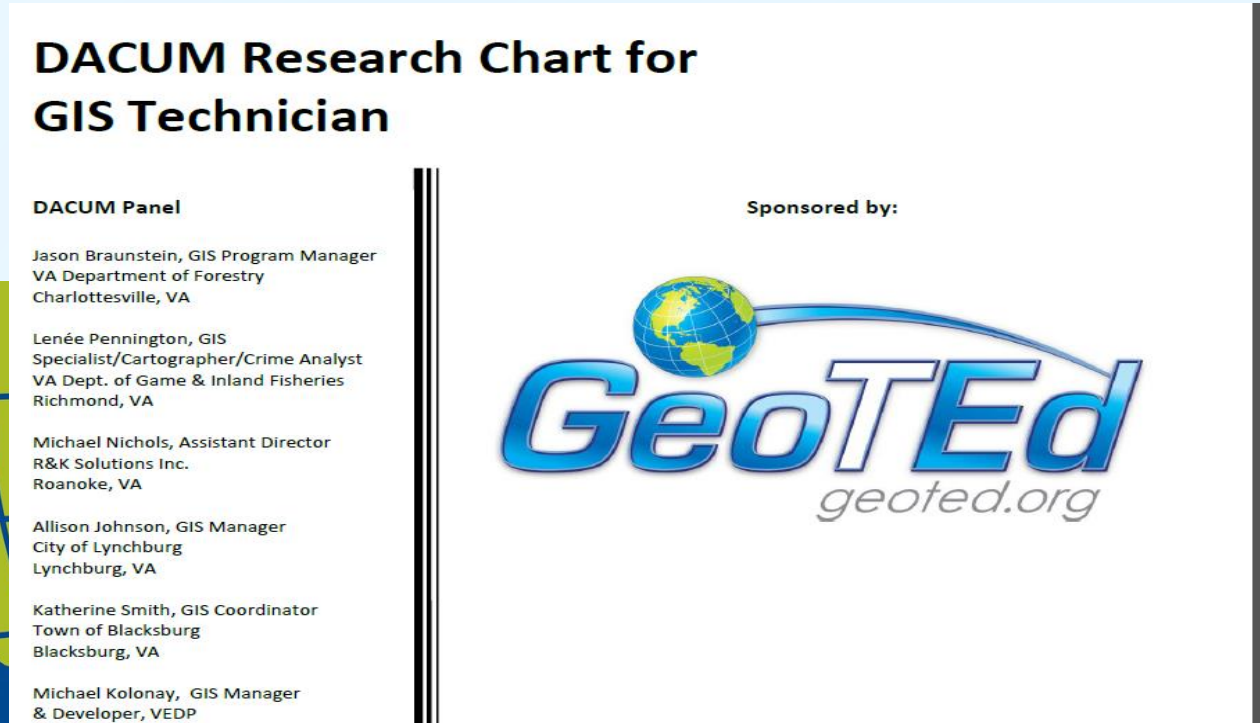
Focus on small UAS (<55lbs) and micro UAS (<4.4lbs)



(GeoTEd-UAS)

1. Workforce Demand and Defining Competencies of a UAS Operations Technician

- Developing a Curriculum (DACUM) Panel
- Alignment with ASPRS Certification – UAS Technologist (in development)



DACUM Research Chart for GIS Technician

DACUM Panel

Jason Braunstein, GIS Program Manager
VA Department of Forestry
Charlottesville, VA

Lenée Pennington, GIS Specialist/Cartographer/Crime Analyst
VA Dept. of Game & Inland Fisheries
Richmond, VA

Michael Nichols, Assistant Director
R&K Solutions Inc.
Roanoke, VA

Allison Johnson, GIS Manager
City of Lynchburg
Lynchburg, VA

Katherine Smith, GIS Coordinator
Town of Blacksburg
Blacksburg, VA

Michael Kolonay, GIS Manager
& Developer, VEDP

Sponsored by:

GeoTEd
geoted.org

asprs

DACUM Research Chart for ~~GIS Technician~~ A UAS Operations Technician

Specific employment tasks →

General employment duties →

A	Manage GIS Data	A-1 Obtain data sets *	A-2 Update versioned data	A-3 Update non versioned data	A-4 Perform QA/QC on GIS data	A-5 Update metadata	A-6 Perform backup of GIS data	A-7 Update data inventory	A-8 Report GIS data changes
B	Create GIS Data	B-1 Create data schema	B-2 Collect field data	B-3 Digitize spatial features	B-4 Georeference spatial data	B-5 Geocode spatial data	B-6 Process raster data	B-7 [illegible]ter survey data [illegible]GO)	B-8 Convert dat across formats (e CADD, KML, CSV, Exce DBF)
C	Create Static Maps	C-1 Collaborate with stakeholders *	C-2 Determine Purpose of map	C-3 Identify specific data sets for map	C-4 Prepare cartographic data sets	C-5 Determine type of layout for map	C-6 [illegible]ign [illegible]t	C-7 Design map template	C-8 Modify existing map document
		C-13 Document customer communication	C-14 Publish static maps	C-15 Print hard copy maps					
D	Create Dynamic Maps/applications	D-1 Determine purpose of application	D-2 Identify data sets for application	D-3 Prepare cartographic data sets for application	D-4 Det[illegible]ine typ[illegible] lay[illegible] for[illegible]plicati	D-5 Design custom application layout	D-6 Modify existing application	D-7 Follow required design specs for application	D-8 Determine application scales
E	Analyze GIS Data	E-1 Define reason for analysis	E-2 Determine feasibility of analysis	E-3 Outline[illegible] an[illegible]ysis proc[illegible]	[illegible]Identify da[illegible]ets	E-5 Identify analysis tools	E-6 Determine analysis parameters (e.g. extent, cell size, filters, relationships)	E-7 Create project workspace	E-8 Prepare dat sets
F	Support Internal/external Customers	F-1 Process customer requests	F-2 Deliver product to custo[illegible]	F-[illegible]evel[illegible] map[illegible]ources (e.g. sym[illegible]ol sets, [illegible]plates, logos)	F-4 Compile training materials	F-5 Provide GIS training	F-6 Provide equipment training (e.g. GPS, plotter, scanner)	F-7 Troubleshoot data issues	F-8 Troubleshoot software issues
G	Maintain Hardware/software Systems	G-1 Initiate IT tickets	G-2 [illegible]all softwa[illegible]	G-3 Install software updates	G-4 Update firmware	G-5 Apply software patches	G-6 Maintain software and equipment inventory	G-7 Change out equipment	
H	Perform Administrative Tasks	H-1 [illegible]aintain sup[illegible]ventor[illegible]	H-2 Submit timesheet	H-3 Submit travel requests	H-4 Submit expense reports (e.g. travel, procurement)	H-5 Archive projects	H-6 Facilitate meetings (e.g. webinar, phone conf., in-person)	H-7 Create purchase requests	H-8 Manage paper files
I	Maintain Professional Knowledge	I-1 Develop personal training plan	I-2 Participate in training activities (e.g. online course, in person sessions)	I-3 Attend professional conferences	I-4 Present at GIS events	I-5 Represent organization at community events	I-6 Review trade publications	I-7 Maintain professional memberships	

*Task is performed across more than one duty

Coming Soon

(GeoTEd-UAS)

2. Academic Course and Pathway Development

- Career Studies Certificate – UAS Operations Technician (18+credit hour) (Model for the VCCS) (Flexible)

Potential Courses

UAS I and II

GIS 200 and 201

Introduction to Remote Sensing

Pilot Ground School

Interdisciplinary; Service Learning; Communication

(GeoTEd-UAS)

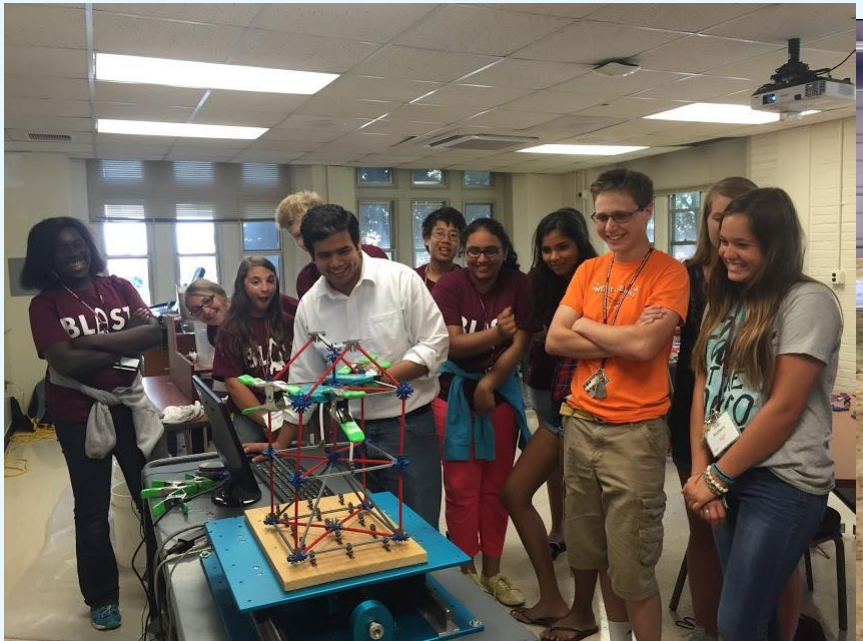
3. Faculty Professional Development

- Train the Trainer (Summer 2016)
- GeoTEd-UAS Train AND Mentor Community College Faculty

(GeoTEd-UAS)

4. Student Pipeline into UAS Careers

- Regional High School UAS Expos and Competitions
- Dual-Enrollment, Transfer, and Articulation Agreements



(GeoTEd-UAS)

Thomas Nelson Community College (Hampton/Williamsburg)

- Integration of UAS into GIS Courses
- Rules and Regulations, Sensors, Image Processing, GIS Analysis
- Partnerships with NASA Langley and Others
- Faculty Experience

(GeoTEd-UAS)

Mountain Empire Community College (Big Stone Gap)

- Avionic and Aviation Mechanics 195-Topics in UAS
- Hands-on introduction to UAS with a specific focus on quadcopters
- Offering Online Ground School
- Faculty Experience

GIS 295 – Topics in Service Learning GIS Course

Fieldwork at NASA Wallops Island

STEM TAKES FLIGHT
at Virginia's Community Colleges

SERVICE LEARNING COURSE OPPORTUNITY AT NASA WALLOPS ISLAND

HELP NASA INVESTIGATE SEA LEVEL RISE AND INVASIVE SPECIES

Thomas Nelson Community College is offering a three-credit Sea Level Rise Service Learning course. All expenses paid for course tuition and four days of fieldwork including travel, lodging, and food! Open to Virginia community college. Competitive application process, students from all disciplines are encouraged to apply. Sponsored by Virginia Space Grant Consortium (VSGC) and offered through the STEM Takes Flight Program in partnership with NASA Wallops Flight Facility and Thomas Nelson Community College.

GIS 295 - Topics in Service Learning in GIS.
This online course contains four days of outdoor fieldwork at NASA Wallops on Virginia's Eastern Shore. Field work will likely be completed over a weekend (Thursday-Sunday) in April 2016.

Faculty-led student teams will engage with NASA scientists to tackle the issue of sea level rise, invasive species and their impact on coastal communities and ecosystems including NASA Wallops. Using GIS, global positioning system (GPS), unmanned aircraft systems, and other technologies students will model various sea level rise scenarios and gauge their impacts to NASA infrastructure and habitats. Students will compare data with existing datasets and develop a report to be presented to NASA staff.

Application: https://www.surveymonkey.com/r/9HXDL88
Application Due Date: December 1, 2015
Notification of acceptance by December 5

http://www.vsgc.odu.edu/STEMtakesFlight/sealevelrise.html

During the course you will
- Learn about service learning.
- How to use and operate an Unmanned Aircraft Systems (UAS) to collect data
- Develop or acquire geographic information system GIS skills in analyzing data collected with a UAS. (Prior GIS knowledge is not a pre-requisite for this cross-discipline course)
- Learn about remote sensing and how to use regular imagery, near infrared imagery and Lidar to answer questions using a GIS.
- Help NASA solve a problem, work side-by-side with NASA scientists
- Gain real world experience collecting and analyzing data
- Tour the facilities and observe the research being completed at the site.

STEM TAKES FLIGHT
at Virginia's Community Colleges

STEM TAKES FLIGHT
at Virginia's Community Colleges

GeoTEd
geoted.org

- **3-Credit Online Course Developed and Offered by Thomas Nelson Community College**
- **Co-Developed with David Webb, GeoTEd Consultant**
- **Funded by VSGC Through the STEM Takes Flight Program**
- **Offered to 14 Students Attending 6 Different Community Colleges**

Content: GIS; Remote Sensing; UAS

Support WFF's Coastal Resilience Initiative

Fieldwork: Sea Level Rise and Phragmites

STEM TAKES FLIGHT
at Virginia's Community Colleges

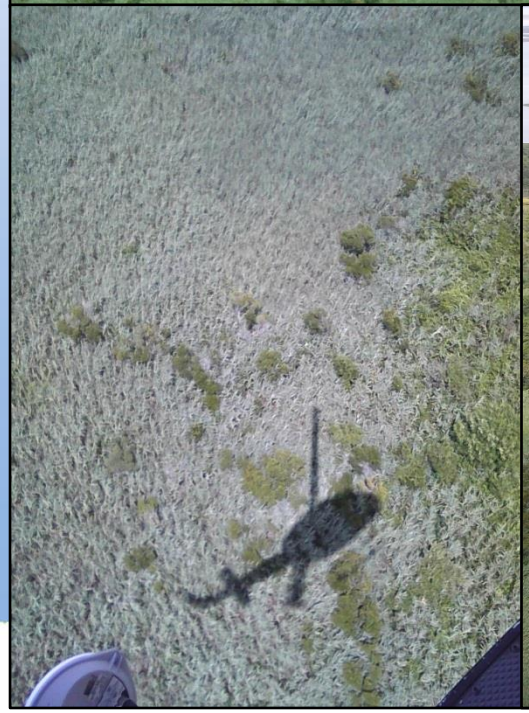
GeoTEd
geoted.org

WIN-WIN!

- **Benefits for Students**
  - **Real-world experience with UAS, instruments, GIS, LiDAR and near-IR data**
- **Benefits for NASA**
  - **Updated LiDAR data (digital elevation model) and shoreline data**
  - **Baseline data for future UAV LiDAR**
  - **Improved mapping of invasive (Phragmites) marsh vegetation**

NASA WALLOPS FLIGHT FACILITY GSFC
WFF

Phragmites



STEM TAKES FLIGHT
at Virginia's Community Colleges

Fly Phantom 2 and Phantom 3 Missions

- True color, near infrared (NIR), and Lidar data
- Students analyze data for invasive species locations and shoreline determination
- Students complete ground truthing of the data
- Final products: georeferenced map layers, DEM, true color, lidar and NIR data. Written report to NASA.
- Fly Missions on April 6-8, 2016

STEM TAKES FLIGHT
at Virginia's Community Colleges

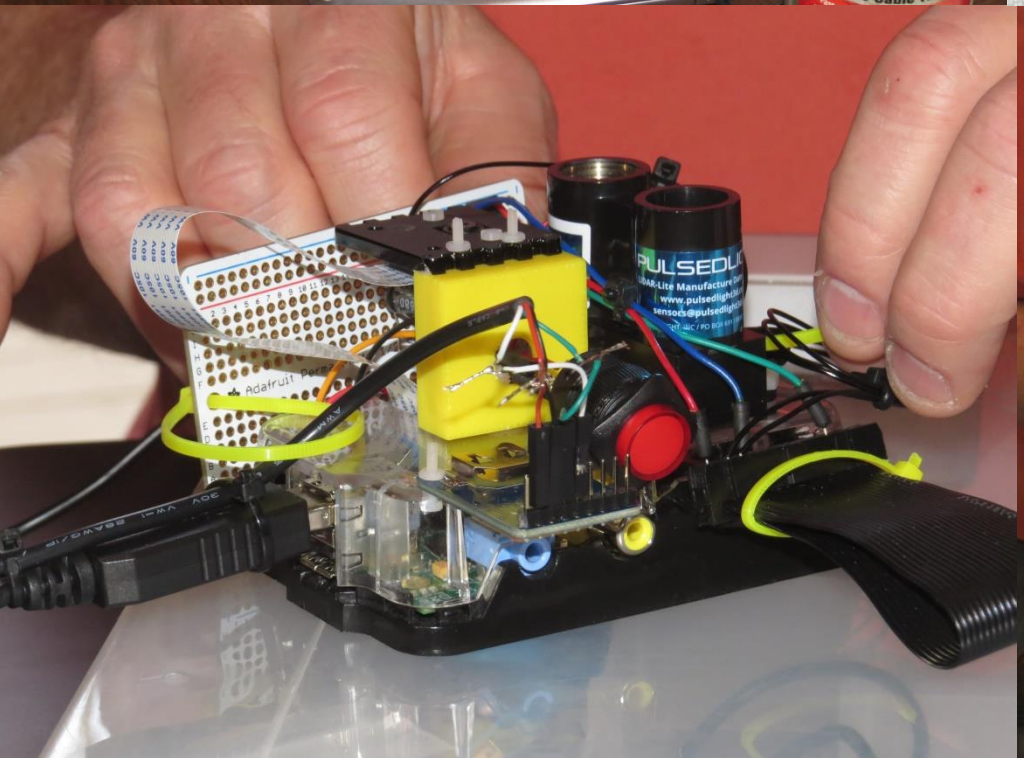
Phantom 2 and 3

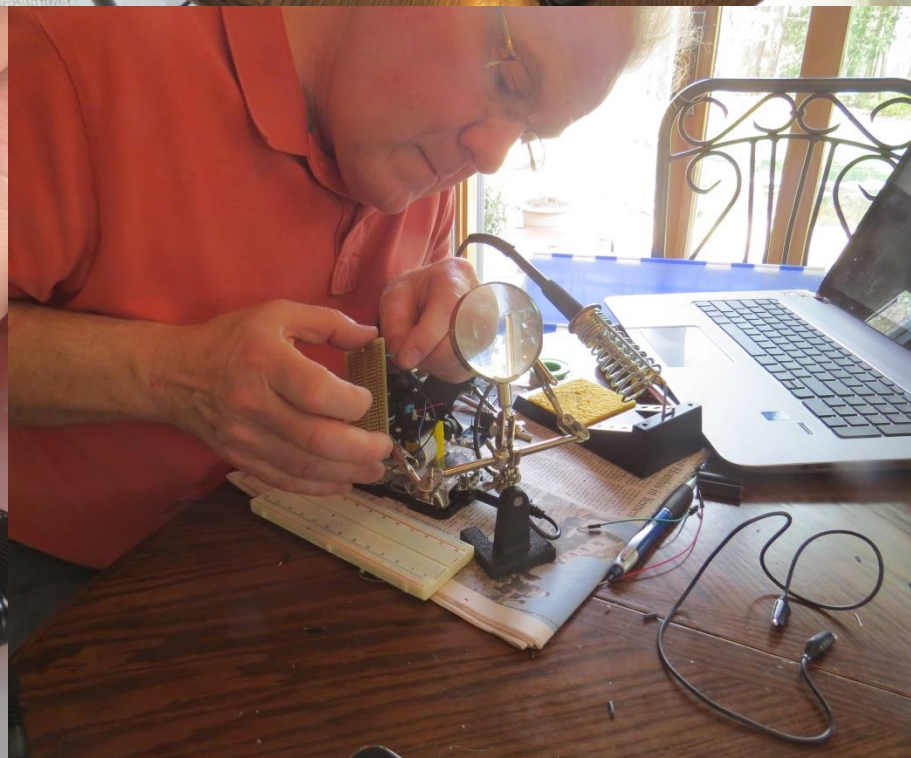
Equipped With:

- **Computer**: Raspberry Pi Model B 512MB
- **NIR camera:** Raspberry Pi NoIR Camera Board - Infrared-sensitive Camera
- **Regular RGB camera:** Raspberry Pi Camera Board
- **Near IR Camera Two:** Infragram DIY Plant Analysis Webcam
- **Lidar:** LIDAR-Lite v2

Software: DroneDeploy


REGAL
1,000pc Cable Tie Set


PULSEDLI



GeoTED-UAS Team

- Dr. John McGee, Virginia Geospatial Extension Specialist, Virginia Tech, jmcg@vt.edu , 540.231.2428
- David Webb, GeoTEd Consultant (Former Community College Faculty), davidewebb@outlook.com
- Cherie Aukland, Associate Professor of IST and Program Head for GIS, Thomas Nelson Community College, auklandc@tncc.edu, 757.258.6592
- Fred Coeburn, Instructor, Mountain Empire Community College, fcoeburn@mecc.edu 276.523.2400 ext. 285

AIM Center

THOMAS NELSON
The Peninsula's Community College

Advanced Integrated Manufacturing Center

The Peninsula's Manufacturing Partnership

STC Science & Technology Corp.
SKF
Newport News Shipbuilding
A Division of Huntington Ingalls Industries
ALCOA
Canon
LIEBHERR
Continental

Developing multi-skilled technicians in advanced manufacturing for the New Virginia Economy

Collaborating in active community partnerships with industry, K-12, economic development and government

Solving the shortage of highly skilled workers for high-tech manufacturing operations

Enhancing the region's technical and economic competitive advantage

Promoting manufacturing as great careers with high wages and ongoing growth in new technologies

Incorporating new products and processes emerging from new advanced technologies – composites, additive manufacturing, robotics, mechatronics

Establishing a model for an innovative educational program focused on project-based learning, problem solving and critical thinking skills, expertise of industry's subject matter experts, and co-op experience

Providing a new associate degree and accelerated career studies certificates beginning Fall 2015

Advanced Integrated Manufacturing (AIM) Multi-Skilled Technicians

Goal: Build a **dynamic partnership** with business and industry to develop multi-skilled technicians in advanced integrated manufacturing

- Teamwork skills developed by working in teams of engineers, researchers, scientists and technologists
- Broad skill base developed through academic program (50%) and rotation of co-op experience (50%)
- Emphasis on new technologies for jobs of the future: composites, additive manufacturing, sensors, robotics, mfg systems….
- Critical thinking and problem solving skills enhanced by developing real manufacturing projects using integrated technology areas
- Technicians/technologists that embrace change, capable of incorporating and utilizing new technologies as they are developed

AIM Programs

A.A.S. in Advanced Integrated Manufacturing

- First cohorts of 16 students Jan 2016 and Aug 2016
- Application and interview with industry partner participation
- Labs in Hastings Hall updated with $500K in additional equipment
- Electronics, mechanical, instrumentation, composites, additive manufacturing

Advanced Integrated Manufacturing Career Studies Certificate

- Prerequisite courses for application to AIM degree (16 credits)
- Precalculus, Electronics, CADD, Mechancial Technology, College English